

(Fachbereich Biologie, Zoologie, der Universität Frankfurt am Main)

***Camponotus (Karavaievia) asli* sp. n. and  
*C. (K.) montanus* sp. n., two weaver ant species from  
Malaysia (Formicidae: Formicinae)**

KLAUS DUMPERT, ULRICH MASCHWITZ, WOLFGANG NÄSSIG  
& WOLFGANG DOROW

Received October 1, 1988

**Summary**

Two silk nest weaving ant species from Malaysia are described as members of the subgenus *Karavaievia* Emery 1925: *Camponotus asli* sp. n. Dumpert and *C. montanus* sp. n. Dumpert. Subsequently, the subgenus now consists of seven species which are likely all weaver ants. The new *Karavaievia* species are compared with the already described ones, both with respect to morphological and behavioral characteristics.

**1. Introduction**

In March 1986 and February 1987 two silk nest weaving *Camponotus* species were found in a Malayan rain forest in Selangor which turned out to be new species of the subgenus *Karavaievia* Emery 1925. These species are described in the following as *Camponotus (Karavaievia) asli* and *C. (K.) montanus*. Some information on the behavior of the newly described *Karavaievia* species in comparison to the already known ones is presented in addition.

**TAXONOMY**

(K. Dumpert)

**2. Material and methods**

One colony of *C. asli* was found by W. Nässig in the Gombak Valley, about 25 km north of Kuala Lumpur, near the field station of the University of Malaya. Twenty (20) ♀♀ and one dealate ♀ were used for the description that follows. – In 1987 one colony of *C. montanus* was detected at an altitude of 1100 m by U. Maschwitz. Twenty (20) ♂♂, two (2) ♂♂ and seven (7) ♀♀ of this colony were taken for the description.

The examination of the investigated specimen was made with the aid of a binocular, the measurements of the animals were made using a microscope at a magnification of 65  $\times$ . Scanning electron micrographs were taken by means of a Hitachi S 500.

Explanation of the abbreviations used below:

TL: total length, HL: head length, HW: head width, CI: cephalic index ( $HW \times 100/HL$ ), SL: scapus length, SI: scapus index ( $HW \times 100/SL$ ), PW: pronotal width, OD: ocular diameter. – All measurements are expressed in millimeters and conducted as in DUMPERT (1985).

### 3. Descriptions

#### 3.1 *Camponotus asli* sp. n.

**Derivatio nominis:** The name is derived from the original Malayan inhabitants. The first and hitherto only colony of this species was found in close vicinity to an Asli village.

**Diagnosis:** *C. asli* is the smallest of the yet known *Karavaievia* species. Compared with *C. exsectus* (EMERY, 1903), *C. dolichoderoides* (FOREL, 1911) and *C. overbecki* (DUMPERT, 1985) TL of the ♂♂ is 0.5–1.3 mm smaller. Compared with *C. texens* and *C. gombaki* (DUMPERT, 1985), the differences for TL, HL, and HW of the ♂♂ are highly significant ( $P < 0.01$ ). Propodeal profile of the ♂♂ less rounded than in all other *Karavaievia* species. Anterior clypeal margin of ♀♀ with semicircular excision which is more pronounced than in all other *Karavaievia* ♀♀. Anterior part of clypeus bent upwards; clypeus of all other known *Karavaievia* ♀♀ straight.

**Holotype** ♂: TL 4.5, HL 1.17, HW 1.17, CI 100, SL 1.44, SI 81, PW 0.76, OD 0.35.

Head trapezoidal, with rounded occipital corners; occipital margin straight or slightly concave, head sides convex (fig. 1). Length of head equal to its width (CI 100). Eyes are situated behind the midlength of the sides of the head; their maximum diameter is 0.35 mm, or about 0.3 HW. Apart from a slight projection behind the scapal insertion, frontal carinae are straight, slightly divergent, and extended to about midlength of head. Anterior clypeal margin with wide and weak excision in the middle third and indented edges (fig. 1). Mandibles short, with lateral borders strongly curved and five subequal teeth on each masticatory border. Antennal scapes projecting beyond the occipital margin by about one third of their length. Pedicel longer than the following flagellar segments; apical flagellar segments slightly thickened.

Colour uniformly yellow brown; head – except the dirty yellow front part – darker, gaster lighter with darker segment boundaries. Antennal scapes middle brown, flagella dirty yellow like the tarsi; femora and tibiae yellow



Fig. 1. SE-micrograph of a ♀-head of *Camponotus (Karavaievia) asli*

brown. Surface of head, alitrunk and gaster shining with densely located weak punctures, which are caused by a reticulated structure (fig. 2). Yellowish white decumbent pubescence is dense on the whole body, including scapes and legs. Longer erect and suberect yellowish white hair especially on clypeus, but also on rest of head, alitrunk and gaster.

Alitrunk with a deep impression between promesonotum and propodeum, and two raised stigmata at the deepest point of the impression. Promesonotum, seen in profile, broadly rounded and higher than propodeum. Propodeal profile considerably flattened on top (fig. 3).

Paratype ♂♂: TL  $4.7 \pm 0.3$  (standard deviation), HL  $1.21 \pm 0.07$ , HW  $1.21 \pm 0.06$ , CI  $100 \pm 3$ , SL  $1.45 \pm 0.06$ , SI  $84 \pm 2.2$ , PW  $0.79 \pm 0.05$ , OD  $0.36 \pm 0.03$  or  $0.27 - 0.32$  HW (20 measured)

Holotype: Western Malaysia: Selangor, Gombak Valley, ca. 25 km north of Kuala Lumpur, 3/6/86 W. Nässig leg. (Naturhistorisches Museum, Basel).

Paratypes: 20 ♂♂ with same data as holotype (2 in British Museum (Natural History), London; 2 in Museum of Comparative Zoology at Harvard University; 2 in Malaysia, National Museum of Malaysia; 2 in Museo Civico di Storia Naturale, Genova; 12 in collection of the author).

Gynetype (♀): TL 10.4, HL 2.41, HW 2.13, CI 88, SL 2.26, SI 94, PW 1.81, OD 0.68; dealate, active queen of the colony under investigation



Fig. 2. ♀-ant of *Camponotus* (*K.*) *asli*: cuticular structure of the alitrunk (SE-micrograph)



Fig. 3. Alitrunk of *Camponotus* (*K.*) *asli* ♀ (SE-micrograph)

Head slightly longer than broad (CI 88). Frontal carinae extend about to midlength of the head. Apart from a lateral projection beyond the scapal insertion, they are almost straight and only slightly divergent. Clypeus wider than that of workers (0.66 mm as against 0.48 mm). Its anterior margin shows a median semicircular excision which is more pronounced than in all other *Karavaievia*-♀♀ (fig. 4). Anterior part of the clypeus (nearly one third) of the clypeus is bent upwards. Eyes are situated behind the midlength of the sides of the head and relatively large: OD 0.68 or 0.32 × HW.

Mandibles strong, distinctly rounded on outside and with 5 subequal teeth on inside. Frontal area as in *C. texens* not clearly delimited from neighbouring head parts and thus differing from *C. gombaki* and *C. montana* ♀♀. The body is uniformly brown and shining; anterior half of gaster tergites darker than rest of the gaster; coxa, trochanter, proximal half of tibiae, tarsi and apical antennal segments yellow brown, scutellum blackish brown.

Head, alitrunk and gaster covered with fine light yellow, decumbent pubescence. Longer erect hairs distributed over the whole body. Petiole with a broad base, tapering toward the apex into a narrow ridge, seen from the side. Petiolar apex, seen from above, flattened.

Gynetype, Western Malaysia, Selangor: Gombac Valley, ca. 25 km north of Kuala Lumpur, 31.1.1987, U. Maschwitz leg. (Naturhistorisches Museum, Basel).

3.2 *Camponotus montanus* sp. n.

Derivatio nominis: The name is derived from the fact that this species was found at higher altitudes than the other *Karavaievia* species.

Diagnosis: *Camponotus montanus* is the largest and the most polymorphic of the yet known *Karavaievia* species. Derived from the sites of the hitherto found colonies of this species, it may prefer higher altitudes than the rest of the *Karavaievia* species. Cuticular structure of ♂♂ and ♀♀ much stronger marked than in all other known *Karavaievia* species. Petiolar apex of the ♀♀ distinctly excised. Wings of the ♂♂ darker and their petiolar ridge stronger excised than in all other known *Karavaievia*-♂♂.

Holotype ♀: TL 6.3, HL 1.53, HW 1.73, CI 113, SL 1.78, SI 97, PW 1.08, OD 0.48

Head nearly as long as broad (CI 113). Head sides convex, occipital corners strongly rounded, occipital margin convex (fig. 5). Frontal carinae slightly sinuate, reaching back to midlength of the head, with maximum diameter of 0.48 mm or  $0.27 \times \text{HW}$ . Anterior clypeal margin almost straight.

Head and gaster like scapes dark brown, alitrunk more or less reddish to darker brown, antennal flagellum and legs reddish brown. Surface of head, alitrunk and gaster opaque, covered with very dense punctures; cuticular structure under SEM strongly reticulated, stronger than in all other

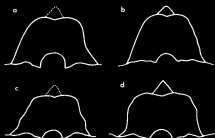


Fig. 4. ♀♀-clypeus of the following species: a) *Camponotus asli*, b) *C. gom-baki*, c) *C. texens*, d) *C. montanus*

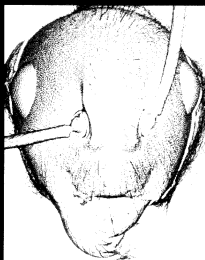


Fig. 5. SE-micrograph of a ♀-ant of *Camponotus (K.) montanus* (SE-micro-graph)

*Karavaievia* species (fig. 6). Yellowish white decumbent pubescence scarce, less dense than in the other *Karavaievia* species; yellowish white, erect and suberect longer hairs occur mainly on forehead and vertex, less dense on alitrunk and gaster.

Alitrunk with a deep impression between promesonotum and propodeum, and two raised stigmata at the deepest point of the impression. Propodum in profile strongly rounded (fig. 7) and as high as promesonotal dorsum. Dorsal part of propodeum convex, descending part slightly flatter.

Paratype ♂♂: TL  $5.8 \pm 0.57$  (standard deviation), HL  $1.52 \pm 0.15$ , HW  $1.54 \pm 0.19$ , CI  $101 \pm 4.15$ , SL  $1.69 \pm 0.12$ , SI  $91.1 \pm 5.57$ , PW  $0.98 \pm 0.1$ , OD  $0.41 \pm 0.04$

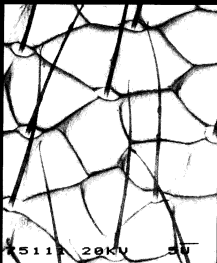


Fig. 6. ♂-ant of *Camponotus* (*K.*) *montanus*: cuticular structure of the alitrunk (SE-micrograph)



Fig. 7. Alitrunk of a *Camponotus* (*K.*) *montanus* ♂ (SE-micrograph)

Holotype ♂, Western Malaysia, Selangor: Gombak Valley, ca. 25 km north of Kuala Lumpur, 26.1.1987, U. Maschwitz leg. (Naturhistorisches Museum, Basel).

Paratypes: 20 ♂♂ with the same data as holotype (2 in British Museum (Natural History), London; 2 in Museum of Comparative Zoology at Harvard University; 2 in Malaysia, National Museum of Malaysia; Kuala Lumpur; 12 in collection of the author).

Gynetype (♀): TL 11.5, HL 2.51, HW 2.51, CI 100, SL 2.61, SI 96, PW 2.21, OD 0.73; alate female

Head as long as wide (CI 100); sides of the head convex, occipital corners rounded, occipital margin slightly concave. Eyes are situated behind the midlength of the sides of the head and relatively smaller than those of *C. asli*-♀♀ ( $0.32 \times HW$  as against 0.27). Frontal carinae extend about to mid-length of head. Apart from a lateral projection behind the scapal insertion, they are almost straight and slightly divergent. Anterior clypeal margin – as in all known *Karavaievia*-♀♀ – with semicircular excision (fig. 8). Frontal area – as in *C. gombaki* – clearly delimited and slightly more shining than the surrounding head parts. Mandibles strong, distinctly rounded on outside, and with 5 subequal teeth on inside.

Body uniformly blackish brown, tibiae and mandibles reddish brown, tarsi and apical flagellar segments yellowish brown. Cuticular structure of head and alitrunk reticulated and not shining. Wings brownish, veins yellow brown. Body covered with yellowish white decumbent pubescence; longer, erect, yellowish white hairs are particularly dense on clypeus, but also on rest of body, including scapes and legs. – Petiolar profile with broad base, which tapers to a transverse ridge. Petiolar ridge with distinct median excision (fig. 9).



Fig. 8. *Camponotus (K.) montanus*: head of a ♀ (SE-micrograph)

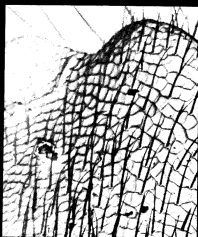


Fig. 9. *Camponotus (K.) montanus*: petiolar apex of a ♀ (SE-micrograph)

Paratype ♀♀: TL  $11.7 \pm 0.3$  (standard deviation), HL  $2.52 \pm 0.04$ , HW  $2.44 \pm 0.06$ , CI  $96 \pm 3.4$ , SL  $2.55 \pm 0.05$ , SI  $95 \pm 3$ , PW  $2.11 \pm 0.07$ , OD  $0.7 \pm 0.03$  (6 measured)

Gynotype (♀, Western Malaysia, Selangor: Gombak Valley, ca. 25 km north of Kuala Lumpur, 26. 1. 1987, U. Maschwitz leg. (Naturhistorisches Museum, Basel).

Paratypes: 6 ♀♀ with same data as gynotype (collection of the author).

Allotype (♂): TL 6.3, HL 1.05, HW 1.10, CI 104, SL 1.13, SI 97, PW 1.56, OD 0.47

The trapezoidal head nearly as long as wide (CI 110), with prominent convex eyes, extending to the upper end of the head sides. Occipital margin strongly convex with protruding ocelli. Clypeus narrow (width about 0.17 mm) with straight anterior margin. Short frontal carinae sinuate, reaching back to midlength of head. Eyes very large; maximum diameter 0.47 mm, or about 0.43 HW. Scapes long, projecting beyond occipital margin of the head by more than half their length. Pedicel expanded at its distal end and thicker than following flagellar segments.

Head, alitrunk and gaster dark brown and only slightly shining, mandibles and clypeus yellow; wings brownish with yellow brown veins. Decumbent pubescence on head and alitrunk, denser on gaster; in addition, body provided with longer, erect hairs. Cuticular sculpture of head, alitrunk and petiole reticulated, that of gaster imbricated. Propodeal profile rounded, with weakly convex dorsal and weakly concave descending part. Petiolar scale triangular in profile, with a broad base tapering to a ridge. Ridge with strong median excision.

Paratype ♂: TL 6.6, HL 1.05, HW 1.10, CI 104, SL 1.08, SI 102, PW 1.63, OD 0.45 (1 measured)

Allotype ♂, Western Malaysia, Selangor: Gombak Valley, ca. 25 km north of Kuala Lumpur, 26. 1. 1987, U. Maschwitz leg (Naturhistorisches Museum, Basel)

Paratype: 1 ♂ with the same data as allotype (collection of the author).

## BEHAVIOUR

(K. Dumpert, W. Dorow, U. Maschwitz and W. Nässig)

The nest construction behaviour of the recently described *Karavaievia* species (*C. texens* and *C. gombaki*) (DUMPERT, 1985) is of special interest. Both species weave silk nests, which are attached under leaves in the case of *C. texens* and between leaves in the case of *C. gombaki*. While *C. texens* reg-



ularly cultivates scale insects in its pavilions, single scale insects were found in only 3 out of 94 *C. gombaki* pavilions. The pavilions of *C. texens* have as a rule one chamber, those of *C. gombaki* often have several (MASCHWITZ et al., 1985). With regard to these differences in the behaviour of the hitherto described species, the nesting behaviour of the newly described *Karavaievia* species demands special interest.

The investigations were carried out by observing the nest construction behaviour in the laboratory, by the investigation of the pavilions and by observations in the field. About half of the nests of *C. asli* and all of the pavilions of the *C. montanus* colony were examined more closely. The inhabitants, about 300 ♂♂ and brood of *C. montanus* and about 200 ♂♂ with little brood of *C. asli* were taken back to Germany and placed in terrariums (100 × 100 × 40 cm) in which *Ficus benjamini* (with scale insects from the greenhouse) were cultivated in flowerpots. The lighting and heating were provided by a Flora set lamp (Osram, HGL - R 88 W de Luxe) in each case. A time switch provided a 12 h day from 7.00 to 19.00. A temperature of 25 - 30°C was maintained. By regular spraying of the plants a humidity of at least 90% could be maintained. Cockroaches cut into small pieces and *Tenebrio* larvae were accepted as food by the ♂♂ of both species.

*Camponotus asli* and *Camponotus montanus* build their silk nests with the help of their larvae. This was shown by direct observations. The larvae are held during the weaving process - as in the case of *C. texens* and *C. gombaki* (MASCHWITZ et al., 1985) - near the front end of their bodies and are regularly touched by the ♂♂'s antennae on their heads and foremost parts of their bodies. The larvae then carry out movements with the foremost part of their bodies. If the head of the larva touches solid substrate it dappes with its labium on the substrate and raise the head again. During that time the expulsion of silk can be observed. Dapping at the substrate and raising themselves up the larvae show frequent movements to the side with the foremost part of their bodies (conf. MASCHWITZ et al., 1985).

Despite intensive searching in various regions of West Malaysia over a total of 12 months, no more than 7 colonies of *Karavaievia* species were found (3 colonies of *Camponotus texens*, 2 colonies of *Camponotus montanus*, and one single colony of *Camponotus gombaki* and of *Camponotus asli* each).

The colony of *Camponotus montanus*, investigated in more detail, was found at an altitude of 1,100 m on a hilltop. Additionally, a second colony with only a few pavilions was found at an altitude of 750 m in the near vicinity by Wolfgang Dorow. The colony of *C. montanus* under investigation settled on two small bushes (about 1.5 meters in height) with small and thick leaves of about 3.5 × 6 cm (fig. 10). The ants were very aggressive and dominated the bushes to that extent that no other ants were found on the nest

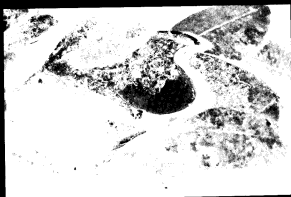


Fig. 10. Pavilion of *Camponotus (K.) montanus* which is built over 7 leaves (photo taken in the field)

tree. When investigating the pavilions we found not only a total of about 500 ♀♀ and brood, but also 7 alate ♀♀ and 2 ♂♂. In addition we detected 2 dealate females, most probably functional queens.

The colony consisted of a total of 47 pavilions which were all woven between leaves, in the vast majority between living but also between dead ones. In the biggest pavilion, found in that colony, no less than 23 living leaves were interconnected with silk material. Those huge pavilions are more than 15 cm in length and consist of a multitude of chambers. The mean number of leaves per pavilion is between 5 and 6. The silken material on the outside of the pavilions is mixed with particles of sand, detritus and pieces from plant material. On the inside, the pavilions were – as a rule – fully covered with a thin but dense layer of silk. The floor of the chambers which is in most cases the upper surface of the leaves incorporated, is nearly always laid out with silk, too.

All of the pavilions of the nesting tree inhabited by ants housed scale insects of different developmental stages (fig. 11) and species (white, brown and black ones). The number of scales per pavilion depends on the size of the nests and varied between 10 and about 500. The ratio between large and small scales is about 1 : 5 on average. In addition there are many very small scales who were found beneath shells of some large ones. Altogether, the colony under investigation disposed of appr. 8,000 scale insects which were all inside the pavilions. We investigated more than 300 leaves outside the pavilions and found no single scale. This holds also for pavilions under construction so that the scales must be carried to the completed pavilions by the ants as in the case of *C. texens* (MASCHWITZ et al., 1988). Inside the pavilions

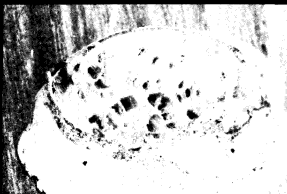


Fig. 11. Leaf from a pavilion of *Camponotus (K.) montanus* with scale insects

the scales are nearly as dense on the undersides as on the uppersides of the leaves. Most of the scales were covered by a thin silk layer, fewer scales were found on a silk layer and some scales on leaves without any silk.

The only colony of *Camponotus asli* was found near the field station of the University of Malaya at an elevation of about 300 m. This colony was found on a tree of about 6 m in height; it exhibited the same aggressiveness as *Camponotus montanus*.

43 Pavilions of this colony were removed and investigated. 30 (70%) of these pavilions were built at the undersides of leaves, forming free hanging pockets, or seldom inside rolled leaves, 5 (12%) between leaves – both, between living and between a living and a dead one – (fig. 12) and 8 (18%) were attached to twigs and to the stalks of leaves. The vast majority of the leaf pavilions contain one single chamber. The size of these pavilions ranges between a length of 3 and 6 cm and a width between 1.5 and 4.5 cm. The silken material at the outside of the pavilions is covered with particles. All pavilions between leaves and within rolled leaves have a silk layer on their floor and some also on their roof.

In contrast to the nests of *Camponotus montanus* which all contained scale insects, only two thirds of the leaf pavilions of *Camponotus asli* contained scale insects and of the twig pavilions aphids. Half of the scale insects containing pavilions were only provided with less than 5 scales. No more than 5% of all the pavilions of *Camponotus asli* were inhabited by more than 20 scales. On the other hand, however, there were probably no scales on the nest tree outside the pavilions. This was revealed by the investigation of 200 leaves of the nest tree outside the pavilions.

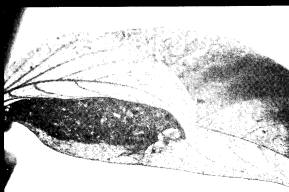


Fig. 12. Pavilion of *Camponotus* (K.) *asli* which is built between 2 living leaves (photo taken in the field)

#### 4. Discussion

Both of the newly described *Karavaievia* species are clearly distinguishable from the hitherto described ones and are doubtlessly new species. With this extension of the species spectrum the picture of the subgenus *Karavaievia* is getting more distinct and more differentiated as well.

The peculiarity of this subgenus of Emery (1923) is originally based on morphological criteria which are shown sufficiently by the newly described species. These common morphological traits include the subuniform size of workers, females and males, the shape of the head, the position of the eyes, the characteristic shape of frontal carinae, clypeus, mandibles, antennae and alitrunk. *Camponotus montanus*, however, extends the hitherto known small spectrum of polymorphism in the worker caste. The size differences between *C. montanus* ♂♂ are considerably more pronounced than in all other species of this subgenus. Thus, the systematic importance of this criterion for the definition of the subgenus is diminished.

A possible common behaviour of all *Karavaievia* species is the weaving of silk nests which, however, has only been investigated for *C. texens* and *C. gombaki* (MASCHWITZ et al., 1985). For *C. overbecki*, there is only the statement of Viehmeyer (1915) that Overbeck found workers and males in "carton nests" on the underside of leaves. These "carton nests" most probably were silk nests, covered with particles. Nothing has become known so far, however, on the nest-building of *C. dolichoderoides* (FOREL, 1911) and *C. exsectus* (EMERY, 1901). The probability that all *Karavaievia* species may be weaver ants is supported by the finding of the new species.

While searching for colonies of *C. dolichoderoides* and *C. exsectus* in Western Malaysia over a period of about 3 months, we only found 1 more colony of *C. texens* and two new *Karavaievia* species. This supports the idea that *Karavaievia* species are very rare and more rich in species than expected.

If *Camponotus texens* is taken as typical for the *Karavaievia* species than the subgenus *Karavaievia* represents a new type of weaver ants, different from *Oecophylla* and *Polyrhachis*, representing two different other types (MASCHWITZ et al., 1985). This new type is characterized by dominance of the territory which is achieved by numerous onechamber pavilions that are distributed on the whole nest tree. These pavilions contain trophobionts as a rule and the majority also hold brood. This combination of brood and trophobionts is accomplished by a typical behaviour of the ♀♀: they actively populate the pavilions with brood and scale insects during nest construction. Outside the pavilions scale insects are not tolerated but thrown to the ground or taken to the pavilions. In this way scales neither come into contact with parasites nor attract predators or ant competitors.

From this type the nesting behaviour of *C. gombaki* is most different. *Camponotus gombaki* is the less aggressive of the yet known *Karavaievia* species and tolerates *Tetraponera*, *Cataulacus*, *Echinopla*, and *Polyrhachis* ants on their nest tree. A second difference concerns the housing of scale insects inside the pavilions: *C. texens* houses scale insects in all pavilions investigated, *C. gombaki* not. Finally, the pavilions are built predominantly on the undersides of the leaves by *C. texens* and between the leave by *C. gombaki*. The pavilions of *C. texens* consist of merely one chamber, as a rule, those of *C. gombaki* were often divided into several chambers.

With respect to nesting behaviour, the newly described *Karavaievia* species are in between *C. texens* and *C. gombaki* and show interesting combinations of the characteristics of the hitherto known species. Both of the new species are more aggressive than *C. gombaki* and therefore more similar to *C. texens*. *Camponotus montana*, like *C. texens*, houses scale insects in their pavilions to that extent that they might be able to get their whole requirement of carbohydrates and at least a portion of their requirement of amino acids from their scales. *Camponotus asli*, on the other hand, houses some scales in their pavilions and therefore more than *C. gombaki*, so it is not shure that the carbohydrates delivered from the scales are sufficient for the ant colony. The pavilions of *Camponotus asli* were composed as a rule of an unbranched pocket of silk, covered with particles. In this respect, *C. asli* is very similar to *C. texens*; this holds also for the pavilions that are attached to twigs and the stalks of leaves which were found in *C. texens* colonies as well. The pavilions of *C. montanus*, on the other hand, do not consist of a free-hanging pocket on the underside of leaves, but lay between two or more

leaves laid one over the other. This type of pavilion is very similar to the predominant type of pavilions in *C. gombaki*. The main difference between both ant species is that the maximum number of leaves incorporated in the pavilions was 4 in *C. gombaki* (MASCHWITZ et al., 1985) and 23 in *C. montana*. This difference characterizes a development of *C. montanus* towards the type of *Oecophylla*-nests and the neotropic weaver *Camponotus* which are always divided into many chambers.

It may be expected that *C. exsectus* and *C. dolichoderoides* and possibly other *Karavaievia* species are discovered in order to gain knowledge of the evolution of the weaving behaviour within the genus *Camponotus* in which the weaving behaviour was "invented" at least 2 times: in the subgenus *Karavaievia* from the old world and in the subgenus *Myrmobrachys* from the new world. One difference between both subgenera is that several non-weaving *Myrmobrachys* species are known while we do not yet know any non-weaving *Karavaievia* species. The nesting behaviour in this subgenus may open the opportunity of understanding one of the developmental roots which lead to the use of larval silk by weaver ants which is "one of the most remarkable social phenomena among animals" (WILSON, 1981).

### Zusammenfassung

Zwei neue Ameisenarten aus Malaysia werden als *Camponotus asli* sp. n. und *Camponotus montana* sp. n. beschrieben. Beide Arten gehören in die Untergattung *Karavaievia* und sind Weberameisen. Damit besteht die Untergattung *Karavaievia* jetzt aus insgesamt 7 Arten, von denen für 4 Arten das Seidenweben nachgewiesen wurde. Gemeinsamkeiten und Unterschiede in Morphologie und Verhalten der neuen im Vergleich zu den bisher beschriebenen Arten von *Karavaievia* werden dargestellt und diskutiert. Es stellte sich heraus, daß *C. montana* sp. n. näher bei *C. texens* steht, *C. asli* sp. n. dagegen näher bei *C. gombaki*. Die drei restlichen *Karavaievia*-Arten wurden seit ihrer Beschreibung vor über 70 Jahren nicht wieder gefunden.

### References

- DUMPERT, K. (1985): *Camponotus (Karavaievia) texens* sp. n. and *C. (K.) gombaki* sp. n. from Malaysia in comparison with the other *Karavaievia* species (Formicidae: Formicinae). *Psyche* 92: 557 - 573.
- EMERY, C. (1901): Formiche raccolte da elio Modigliano in Sumatra, Engano e Mentauei. *Ann. Mus. Stor. Nat. Genova* 40: 709 - 743.
- EMERY, C. (1925): Hymenoptera, Fam. Formicidae. P. Wytman, ed. *Genera Insectorum*, Louis Desmet-Verteneuil, Brussels.
- FOREL, A. (1911): Fourmis de Borneo, Singapore, Ceylon, etc. *Rev. Suisse Zool.* 19: 23 - 62.

- MASCHWITZ, U., K. DUMPERT & G. SCHMIDT (1985): Silk pavilions of two *Camponotus* (*Karavaievia*) species from Malaysia: description of a new nesting type in ants (Formicidae: Formicinae). *Z. Tierpsychol.* 69: 237 - 249.
- VIEHMEYER, H. (1915): Ameisen von Singapore, beobachtet und gesammelt von H. Overbeck, beschrieben von H. Viehmeyer. *Arch. Naturgesch.* 81: 108 - 169.
- WILSON, E. O. (1981): Communal silk-spinning by larvae of *Dendromyrmex* tree-ants (Hymenoptera: Formicidae). *Ins. soc.* 28: 182 - 190.

Address of the authors:

Dr. KLAUS DUMPERT  
Prof. Dr. ULRICH MASCHWITZ  
WOLFGANG NÄSSIG  
WOLFGANG DOROW  
Fachbereich Biologie, Zoologie  
der Universität  
Siesmayerstr. 70  
D-6000 Frankfurt am Main